Tables

Table 2-1 Proposed Station Coordinates

Station	NAD27, Washington State		Global Positioning	
	Northing (y axis)	Easting (x axis)	Latitude	Longitude
Test Stations				
IJW-SS-01	644171	1599581	48.76576608	121.0026447
IJW-SS-02	644340	1599613	48.76622934	121.0025129
IJW-SS-03	644191	1599674	48.76582201	121.0022568
IJW-SS-04	644324	1599702	48.76618566	121.0021435
IJW-SS-05	644472	1599738	48.76659123	121.0019942
IJW-SS-06	644355	1599804	48.76627174	121.0017185
IJW-SS-07	644628	1599910	48.76701885	121.0012812
IJW-SS-08	644591	1599992	48.76691924	121.0009418
IJW-SS-09	644667	1600029	48.76712818	121.0007892
IJW-SS-10	644622	1600114	48.76700356	121.000437
IJW-SS-11	644766	1600035	48.76739835	121.0007645
IJW-SS-12	644507	1599994	48.76668896	121.0009335
IJW-SS-13	644536	1599855	48.76676762	121.0015101

Notes:

Proposed coordinates are in Washington State Plane North Zone (feet) North American Datum (NAD) 1927 and converted to World Geodetic System (WGS), 1984.
One or more reference samples will be collected from Samish Bay based on similar grain size and organic carbon content.

Table 2-2 Analyte Categories, Analysis Methods, Holding Times, and Container Requirements

Analyte Category	Analysis Method	Holding Time 4°C	Holding Time -11°C	Jar Requirements
Volatile Organics	USEPA 8260	14 days to extraction, 40 days from extraction to analysis	1 year	4-ounce Glass with septa
Semivolatile Organics	USEPA 8270	14 days to extraction, 40 days from extraction to analysis	1 year	16-ounce Glass
PCBs	USEPA 8081	14 days to analysis	NA [1]	8-ounce Glass
Metals (including nickel)	USEPA Methods 6010/7471	6 months (28 days for mercury)	NA [1]	4-ounce Glass
Conventionals				
Total Solids	PSEP	7 days	6 months	4-ounce Glass
Total Volatile Solids	PSEP	7 days	6 months	
pH	USEPA 9045	NA	6 months	
Total Organic Carbon	PSEP	28 days	6 months	
Ammonia	PSEP	28 days	6 months	
Total Sulfides	PSEP	7 days dark	NA	4-ounce Glass topped with 2 ml 2N ZnAc headspace free
Physical				
Physical Grain Size	PSEP	6 months	NA [1]	16-ounce Glass
Biological [2]				
Neanthes Arenaceodentata 20-day Growth	PSEP	2 months	NA [1]	(3) - 2-liter Plastic headspace free
Eohaustorius estuarius 10-day Mortality	PSEP			
Dendraster excentricus larvae	PSEP			

Notes:

[1] Holding parameters only specify that the sample must be processed within a period of time that does not allow water loss (per Harold Benny, Rosa Environmental).

[2] Samples will be stored at 4 °C to maximize sample integrity and minimize changes from the presence of biota and/or organic carbon.

Table 2-3 Sediment Chemical Analysis Methods, Target Detection Limits, and Criteria

Parameter	Preparation Method	Analysis Method	Target RDL [1]	SMS Criteria [2] SQS	SMS Criteria [2] MCUL
Conventionals					
Total Solids (%)	--	PSEP [4a]	0.1	nv	nv
Total Volatile Solids(%)	--	PSEP [4a]	0.1	nv	nv
Total Organic Carbon (%)	--	PSEP [4b]	0.1	nv	nv
Ammonia (mg/kg)	--	EPA 350.1 [5]	1	nv	nv
Total Sulfides (mg/kg)	--	PSEP [4a]	10	nv	nv
Grain Size (%)	--	PSEP [4a]	1	nv	nv
Metals					
Antimony	Appendix D [4]	GFAA [6]	5	nv	nv
Arsenic	Appendix D [4]	ICP [7]	5	57	93
Cadmium	Appendix D [4]	ICP [7]	0.2	5.1	6.7
Chromium	Appendix D [4]	ICP [7]	0.5	260	270
Copper	Appendix D [4]	ICP [7]	0.2	390	390
Lead	Appendix D [4]	ICP [7]	2	450	530
Mercury	MER [8]	7471 [8]	0.05	0.41	0.59
Nickel	Appendix D [4]	ICP [7]	0.01	nv	nv
Silver	Appendix D [4]	ICP [7]	0.3	6.1	6.1
Zinc	Appendix D [4]	ICP [7]	1.0	410	960
LPAH					
Naphthalene	3550 [9]	8270 [10]	0.02	99	170
Acenaphthylene	3550 [9]	8270 [10]	0.02	66	66
Acenaphthene	3550 [9]	8270 [10]	0.02	16	57
Fluorene	3550 [9]	8270 [10]	0.02	23	79
Phenanthrene	3550 [9]	8270 [10]	0.02	100	480
Anthracene	3550 [9]	8270 [10]	0.02	220	1200
2-Methylnaphthalene	3550 [9]	8270 [10]	0.02	38	64
Total LPAH				370	780
HPAH					
Fluoranthene	3550 [9]	8270 [10]	0.02	160	1200
Pyrene	3550 [9]	8270 [10]	0.02	1000	1400
Benzo(a)anthracene	3550 [9]	8270 [10]	0.02	110	270
Chrysene	3550 [9]	8270 [10]	0.02	110	460
Benzofluoranthenes	3550 [9]	8270 [10]	0.02	230	450
Benzo(a)pyrene	3550 [9]	8270 [10]	0.02	99	210
Indeno(1,2,3-cd)pyrene	3550 [9]	8270 [10]	0.02	34	34
Dibenzo(a,h)anthracene	3550 [9]	8270 [10]	0.02	12	33
Benzo(g,h,i)perylene	3550 [9]	8270 [10]	0.02	31	78
Total HPAH				960	5300
Chlorinated Hydrocarbons					
1,3-Dichlorobenzene	P&T [11]	8240 [11]	0.0032	nv	nv
1,4-Dichlorobenzene	P&T [11]	8240 [11]	0.0032	3.1	9
1,2-Dichlorobenzene	P&T [11]	8240 [11]	0.0032	2.3	2.3
1,2,4-Trichlorobenzene	3550 [9]	8270 [10]	0.006	0.81	1.8
Hexachlorobenzene	3550 [9]	8270 [10]	0.012	0.38	2.3
Phthalates					
Dimethyl phthalate	3550 [9]	8270 [10]	0.02	53	53
Diethyl phthalate	3550 [9]	8270 [10]	0.02	61	110
Di-n-butyl phthalate	3550 [9]	8270 [10]	0.02	220	1700
Butyl benzyl phthalate	3550 [9]	8270 [10]	0.02	4.9	64
Bis(2-ethylhexyl)phthalate	3550 [9]	8270 [10]	0.02	47	78
Di-n-octyl phthalate	3550 [9]	8270 [10]	0.02	58	4500
Phenols					
Phenol	3550 [9]	8270 [10]	0.020	0.42	1
2-Methylphenol	3550 [9]	8270 [10]	0.020	0.063	0.063
4-Methylphenol	3550 [9]	8270 [10]	0.020	0.67	0.67
2,4-Dimethylphenol	3550 [9]	8270 [10]	0.020	0.029	0.029
Pentachlorophenol	3550 [9]	8270 [10]	0.100	0.36	0.69
Miscellaneous Extractables					
Benzyl alcohol	3550 [9]	8270 [10]	0.020	0.057	0.073
Benzoic acid	3550 [9]	8270 [10]	0.200	0.65	0.65
Miscellaneous Extractables					
Dibenzofuran	3550 [9]	8270 [10]	0.020	15	58
Hexachloroethane	3550 [9]	8270 [10]	0.020	nv	nv
Hexachlorobutadiene	3550 [9]	8270 [10]	0.020	3.9	6.2
N-Nitrosodiphenylamine	3550 [9]	8270 [10]	0.020	11	11
Volatile Organics					
Trichloroethene	P&T [11]	8260 [12]	0.0032	nv	nv
Tetrachlorethene	P&T [11]	8260 [12]	0.001	nv	nv
Ethylbenzene	P&T [11]	8260 [12]	0.001	nv	nv
Total xylenes	P&T [11]	8260 [12]	0.001	nv	nv
Pesticides					
DDT	3550 [9]	8081 [13]	0.003	nv	nv
Aldrin	3550 [9]	8081 [13]	0.0017	nv	nv
alpha-chlordane	3550 [9]	8081 [13]	0.0017	nv	nv
dieldrin	3550 [9]	8081 [13]	0.0023	nv	nv
heptachlor	3550 [9]	8081 [13]	0.0017	nv	nv
alpha-BHC	3550 [9]	8081 [13]	0.0017	nv	nv
gamma-BHC (Lindane)	3550 [9]	8081 [13]	0.0017	nv	nv
Total PCBs	3550 [9]	8081 [13]	0.160	12	65

Notes:

1 Reporting detection limit (MDL) values are equivalent to Ecology's term Practical Quantitation Limit (PQL) - from Analytical Resources, Inc. (ARI) laboratory - expressed on a dry weight basis.

Note that some SMS criteria are expressed as the carbon-normalized value (ppm TOC) - see note 2 below - direct comparison to the detection limits cannot be made without a TOC conversion factor.

2 Sediment Management Standards (SMS), includes Sediment Quality Levels (SQL) [low screen] and Maximum Chemical Criteria (MCUL) [high screen] expressed as mg/kg dw; The following are TOC normalized: LPAH, HPAH, Chlorinated hydrocarbons, phthalates, misc.e

3 Puget Sound Estuary Program (PSEP), Recommended Protocols for Measuring Organic Compounds in Puget Sound, 1996. TBT extraction method is Krone, 1988.

4a Puget Sound Estuary Program (PSEP), Recommended Protocols for Measuring Conventional Sediment Variables in

4b Puget Sound Estuary Program (PSEP), Recommended Protocols for Measuring Conventional Sediment Variables in

5 Plumb, 1981. EPA/U.S. Army Corps of Engineers procedures for measuring ammonia.

6 Graphite Furnace Atomic Absorption (GFAA) Spectrometry. SW-846. EPA, 1986.

7 Inductively Coupled Plasma (ICP) Emission Spectrometry. SW-846. EPA, 1986.

8 Mercury Digestion and Cold Vapor Atomic Absorption (CVAA) Spectrometry, Method 7471. SW-846. EPA 1986.

9 Sonication Extraction of Sample Solids, Method 3550 (Modified). SW-846. EPA, 1986. Method is modified to add matrix spikes before, rather than after, the dehydration step.

10 GCMS Capillary Column, Method 8270. SW-846. EPA, 1986.

11 Purge and Trap Extraction and GCMS Analysis, Method 8240. EPA, 1986.

12 Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS): Capillary Column Technique,

13 Organochlorine Pesticides and PCBs as Arochlors by Gas Chromatography and Capillary Column Technique, Method

nv - No value currently established under SMS.

Table 2-4 Key for Physical Description of Sediment Samples

Sample Description

Classification of soils in this report is based on visual field and laboratory observations which include density/consistency, moisture condition, grain size, and plasticity estimates and should not be construed to imply field nor laboratory testing unless presented herein. Visual-manual classification methods of ASTM D-2488 were used as an identification guide.

Soil descriptions consist of the following:
Density/consistency, moisture, color, minor constituents, MAJOR CONSTITUENT, additional remarks.

Density/Consistency

Soil density/consistency is estimated based on visual observation and is presented parenthetically on the test pit logs.

SAND or GRAVEL	Standard Penetration Resistance (N) in Blows/Foot	Visual Description	SILT or CLAY	Standard Penetration Resistance (N) in Blows/Foot	Approximate Shear Strength in TSF	Visual Description
Density			***Consistency***			
Very loose	0–4	freefall	Very soft	0–2	<0.125	ooze, no shape
Loose	4–10	easy penetration	Soft	2–4	0.125–0.25	saggy shape
Medium dense	10–30		Medium stiff	4–8	0.25–0.5	holds shape
Dense	30–50	low penetration	Stiff	8–15	0.5–1.0	holds shape
Very dense	>50	refusal	Very stiff	15–30	1.0–2.0	low penetration
			Hard	>30	>2.0	refusal

Moisture	
Dry	Little perceptible moisture
Damp	Some perceptible moisture, probably below optimum
Moist	Probably near optimum moisture content
Wet	Much perceptible moisture, probably above optimum; subcategories include soupy and flocculant for increasing moisture content

Minor Constituents	***Percentage (by weight)***
Not identified in description	0–5
Slightly (clayey, silty, etc.)	5–12
Clayey, silty, sandy, gravelly	12–30
Very (clayey, silty, etc.)	30–50
MAJOR CONSTITUENTS	Majority or >50

Surface Sediment Sample Acceptability Criteria (PSEP)

1. Overlying water is present.
2. Water has low turbidity.
3. Sampler is not overfilled.
4. Surface is flat.
5. Penetration depth is acceptable.

Core Sample Acceptability Criteria

1. Core tube not overfilled.
2. Overlying water is present and surface interval is intact.
3. Estimated compaction is not greater than 25%.
4. Core tube appears intact without obstruction and blocking.

Estimated Percentage of Other Minor Constituents

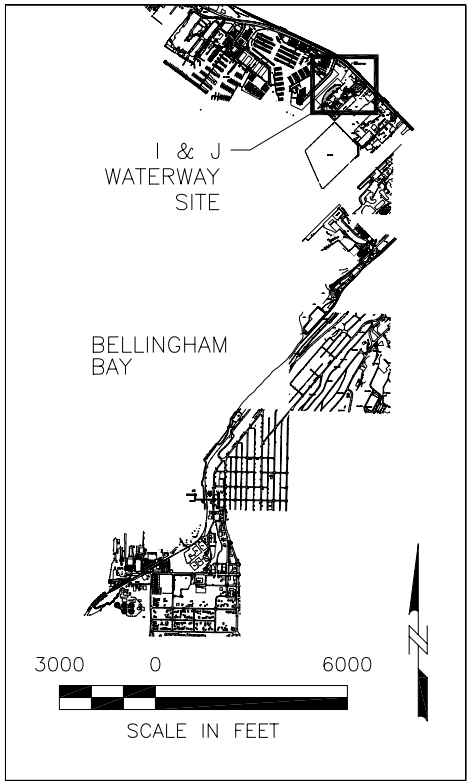
(i.e., shells, wood, organics, plastic, metal brick, refuse)

Estimated Percentage (by volume)	
Dusting	Trace on Surface
Trace	0–5
Occasional	5–10
Moderate	10–30
Substantial	30–50
Majority	>50

Table 5-1 Method QA/QC Sample Frequencies for Analytical Sampling

QA/QC Sample Type	Sampling and Analysis Frequency
Laboratory QA/QC (to be reported and validated)	
Method Blanks	One per 20
Laboratory Control Samples	One per 20
Laboratory Control Duplicates	One per 20
Laboratory triplicates for TOC/Grain Size	One per 20
Detection Limits	Table 2-3
Holding Times	Table 2-2
Surrogate Compounds	Every field & QA/QC sample
Blind certified reference material	One per 20
Laboratory QA/QC (internal lab requirements)	
Initial Calibration	Following Lab SOP
Continuing Calibration	Following Lab SOP
Internal Standards	Following Lab SOP

Figures



RI/FS
INVESTIGATION AREA

CURRENT EXTENT OF
SMS CHEMICAL AND
BIOLOGICAL EXCEEDANCES

I & J WATERWAY

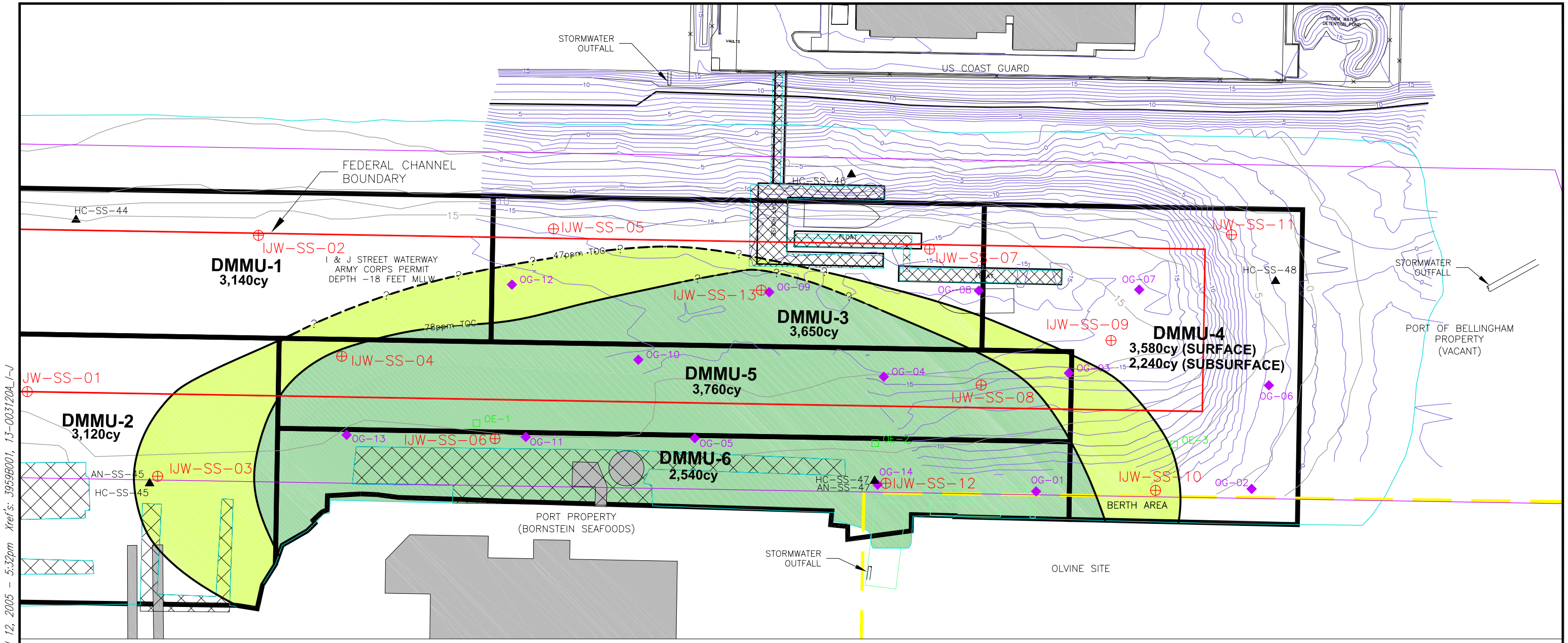
Pipe
Paved
Conc
FH
Rails Obscured
Dock
Stack
RTV
Unpaved Parking
Storage
Boat Storage

NOTE:
THE INVESTIGATION AREA MAY BE EXPANDED IF CONTAMINATION APPEARS TO EXTEND BEYOND THE CURRENT INVESTIGATION AREA.

100 0 200
SCALE IN FEET
N

RETEC

I&J WATERWAY RI/FS WORK PLAN PORTB-18449-100			**SITE LOCATION MAP**
DATE: 06/15/05	DRWN: A.S./SEA		**FIGURE 1-1**



LEGEND

- DOCKS OR PIERS
- EXISTING STRUCTURES
- EXISTING SHORELINE
- 25 — BATHYMETRY (FEET BELOW MLLW PER WHATCOM WATERWAY RI/FS REPORT)
- CURRENT OLIVINE UPLAND SITE BOUNDARY
- I & J WATERWAY BOUNDARY

- ▲ HC-SS-47 — WHATCOM WATERWAY STATION SEDIMENT GRAB SAMPLE (HART CROWSER, 1997)
- ◆ OG-10 — 2001 RETEC STATION SURFACE SEDIMENT GRAB SAMPLE
- □ OE-1 — PRE-REMEDIAL DESIGN TESTING STATION (COMPOSITE FOR LEACHING TESTS 2002) (SAMPLE TO BE COLLECTED 0-3FT BELOW MUDLINE)
- ⊕ IJW-SS-02 — PROPOSED RI/FS SAMPLE LOCATION
- ▲ AN-SS-47 — ANCHOR BIOASSAY SAMPLE LOCATION

- bis(2-Ethylhexyl)phthalate EXCEEDS CHEMICAL SQS CRITERIA (47ppm TOC)
- bis(2-Ethylhexyl)phthalate EXCEEDS CHEMICAL MCUL CRITERIA (78ppm TOC)

NOTE:

EXCEEDENCES OF SQS BIOLOGICAL EFFECTS CRITERIA WERE PREVIOUSLY DETECTED AT STATION AN-SS-45. EXCEEDENCES OF MCUL BIOLOGICAL EFFECTS CRITERIA WERE PREVIOUSLY DETECTED AT STATION AN-SS-47.

30 0 60

SCALE IN FEET

RETEC

I & J WATERWAY RI/FS SAMPLING AND ANALYSIS PLAN PORTB-18449-100				PROPOSED I & J WATERWAY RI/FS SURFACE SEDIMENT SAMPLE LOCATIONS
DATE: 07/12/05	DRWN: A.S./SEA			FIGURE 1-2

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Attachment A

Standard Operating Procedures

SOP 110—Packing and Shipping Samples

1 Purpose and Applicability

RETEC SOP 110 describes proper packaging methods and shipment of samples to minimize the potential for sample breakage, leakage, or cross contamination, and provide a clear record of sample custody from collection to analysis. Specific project requirements as described in an approved Work Plan, Sampling Plan, Quality Assurance Project Plan, or Health and Safety Plan will take precedence over the procedures described in this document.

The United States Environmental Protection Agency (USEPA) Resource Conservation and Recovery Act (RCRA) regulations (40 CFR Section 261.4[d]) specify that samples of solid waste, water, soil, or air collected for the purpose of testing are exempt from regulation when any of the following conditions apply:

- Samples are being transported to a laboratory for analysis;
- Samples are being transported to the collector from the laboratory after analysis; and
- Samples are being stored: (a) by the collector prior to shipment for analyses, (b) by the analytical laboratory prior to analyses, or (c) by the analytical laboratory after testing but prior to return of sample to the collector or pending the conclusion of a court case.

Samples collected by RETEC are generally qualified for these exemptions. RETEC SOP 110 deals only with these sample types.

2 Responsibilities

The field sampling coordinator is responsible for the enactment and completion of the chain-of-custody, and the packaging and shipping requirements outlined here and in project-specific sampling plans.

3 Supporting Materials

The following materials must be on hand and in sufficient quantity to ensure that proper packing and shipping methods and procedures may be followed:

- Chain-of-custody forms and seals;
- Sample container labels;
- Coolers or similar shipping containers;
- Duct tape or transparent packaging tape;
- Ziploc-type bags;
- Protective wrapping and packaging materials;
- Ice or cold packs;
- Shipping labels for the exterior of the ice chest; and

- Transportation carrier forms (Federal Express, Airborne, etc.).

4 Methods and Procedures

All samples must be packaged so that they do not leak, break, vaporize, or cause cross-contamination of other samples. Waste samples and environmental samples (e.g., groundwater, soil, etc.) should not be placed in the same container. Each individual sample must be properly labeled and identified. A chain-of-custody record must accompany each shipping container. When refrigeration is required for sample preservation, samples must be kept cool during the time between collection and final packaging.

All samples must be clearly identified immediately upon collection. Each sample bottle label will include the following information:

- Client or project name, or unique identifier, if confidential;
- A unique sample description;
- Sample collection date and time;
- Sampler's name or initials;
- Indication of filtering or addition of preservative, if applicable; and
- Analyses to be performed.

After collection, identification, and preservation (if necessary), the samples will be maintained under chain-of-custody procedures as described below.

5 Chain of Custody

A sample is considered to be under custody if it is in one's possession, view, or in a designated secure area. Transfers of sample custody must be documented by chain-of-custody forms (ThermoRetec, 2000). The chain-of-custody record will include, at a minimum, the following information:

- Client or project name, or unique identifier, if confidential;
- Sample collector's name;
- Company's (RETEC) mailing address and telephone number;
- Designated recipient of data (name and telephone number);
- Analytical laboratory's name and city;
- Description of each sample (i.e., unique identifier and matrix);
- Date and time of collection;
- Quantity of each sample or number of containers;
- Type of analysis required; and
- Date and method of shipment.

Additional information may include type of sample containers, shipping identification air bill numbers, etc.

When transferring custody, both the individual(s) relinquishing custody of samples and the individual(s) receiving custody of samples will sign, date, and

note the time on the form. If samples are to leave the collector's possession for shipment to the laboratory, the subsequent packaging procedures will be followed.

6 Packing for Shipment

To prepare a cooler for shipment, the sample bottles should be inventoried and logged on the chain-of-custody form. At least one layer of protective material should be placed in the bottom of the container. As each sample bottle is logged on the chain-of-custody form, it should be wrapped with protective material (e.g. bubble wrap, matting, plastic gridding, or similar material) to prevent breakage. Each sample bottle should be placed upright in the shipping container. Each sample bottle cap should be checked during wrapping and tightened if needed. Avoid over tightening, which may cause bottle cap to crack and allow leakage. Additional packaging material such as bubble wrap or Styrofoam pellets should be spread throughout the voids between the sample bottles.

Most samples require refrigeration as a minimum preservative. Reusable cold packs or ice placed in heavy-duty Ziploc-type bags should be distributed under the bottom and over the top of the samples. Two or more cold packs or bags should be used. Additional packing material should then be placed to fill the balance of the cooler or container.

Place the original completed chain-of-custody record in a Ziploc-type plastic bag and place the bag on the top of the contents within the cooler or shipping container. Alternatively, the bag may be taped to the underside of the container lid. Retain a copy of the chain-of-custody record with the field records.

Close the top or lid of the cooler or shipping container and rotate/shake the container to verify that the contents are packed so that they do not move. Add additional packaging if needed and reclose.

Place signed and dated chain-of-custody seal at two different locations (front and back) on the cooler or container lid and overlap with transparent packaging tape. The chain-of-custody seal should be placed on the container in such a way that opening the container will destroy the seal. Packaging tape should encircle each end of the cooler at the hinges.

Sample shipment should be sent via an overnight express service that can guarantee 24-hour delivery. Retain copies of all shipment records as provided by the shipper.

7 Quality Assurance/Quality Control (QA/QC)

Recipient of sample container should advise shipper and/or transporter immediately of any damage to container, breakage of contents, or evidence of tampering.

8 Documentation

The documentation for support of proper packaging and shipment will include RETEC or the laboratory chain-of-custody records and transportation carrier's air bill or delivery invoice. All documentation will be retained in the project files.

9 Reference

ThermoRetec, 2000. *Quality Assurance Project Plan for the Phase II RCRA Facility Investigation, BP Amoco North Properties Area, Casper, Wyoming.* ThermoRetec Consulting Corporation, Golden, Colorado. March 31.

SOP 120—Decontamination

1 Purpose and Applicability

RETEC SOP 120 describes the methods to be used for the decontamination of items that may become contaminated during field operations. Decontamination is performed as a QA measure and as a safety precaution. It prevents cross contamination between samples and also helps maintain a clean working environment. Equipment requiring decontamination may include hand tools, monitoring and testing equipment, personal protective equipment, or heavy equipment (e.g., loaders, backhoes, drill rigs, etc.).

Decontamination is achieved mainly by rinsing with liquids that may include soap and/or detergent solutions, tap water, distilled water, and methanol. Equipment may be allowed to air dry after being cleaned or may be wiped dry with paper towels or chemical-free cloths.

All sampling equipment will be decontaminated prior to use and between each sample collection point. Waste products produced by the decontamination procedures, such as rinse liquids, solids, rags, gloves, will be collected and disposed of properly based on the nature of contamination and site protocols. Any materials and equipment that will be reused must be decontaminated or properly protected before being taken off site.

Specific project requirements as described in an approved Work Plan, Sampling Plan, Quality Assurance Project Plan, or Health and Safety Plan will take precedence over the procedures described in this document.

2 Responsibilities

It is the responsibility of the field sampling coordinator to ensure that proper decontamination procedures are followed and that all waste materials produced by decontamination are properly managed. It is the responsibility of any subcontractors (e.g., drilling or sampling contractors) to follow the proper designated decontamination procedures that are stated in their contracts and outlined in the project Health And Safety Plan. It is the responsibility of all personnel involved with sample collection or decontamination to maintain a clean working environment and to ensure that no contaminants are negligently introduced into the environment.

3 Supporting Materials

The following materials should be on hand in sufficient quantity to ensure that proper decontamination methods and procedures may be followed:

- Cleaning liquids and dispensers (soap and/or detergent solutions, tap water, distilled water, methanol, or isopropyl, etc.);
- Personal safety gear, as defined in the project Health And Safety Plan;
- Paper towels or chemical-free cloths;

- Disposable gloves;
- Waste storage containers (e.g., drums, boxes, plastic bags);
- Drum labels, if necessary;
- Cleaning containers (e.g., plastic and/or galvanized steel pans or buckets);
- Cleaning brushes; and
- Plastic sheeting.

4 Methods and Procedures

The extent of known contamination will determine the degree of decontamination required. When the extent of contamination cannot be readily determined, cleaning should be done according to the assumption that the equipment is highly contaminated.

Standard operating procedures listed below describe the method for full field decontamination. If different technical procedures are required for a specific project, they will be spelled out in the project plans.

Such variations in decontamination may include all or an expanded scope of these decontamination procedures:

- Remove gross contamination from the equipment by brushing and then rinse with tap water from top to bottom;
- Wash with detergent or soap solution (e.g., Alconox and tap water);
- Rinse with tap water from top to bottom;
- Rinse with methanol or isopropyl from top to bottom;
- Rinse with distilled water from top to bottom;
- Repeat entire procedure or any parts of the procedure, as necessary; and
- After decontamination procedure is completed, avoid placing equipment directly on ground surface to avoid recontamination.

Downhole drilling equipment, such as augers, split spoons, Shelby tubes, and sand lines, will be decontaminated with pressurized hot water or steam wash, followed by a fresh water rinse. No additional decontamination procedures will be required if the equipment appears to be visually clean. If

contamination is visible after hot water/steam cleaning, then a detergent wash solution with brushes (if necessary) will be used.

5 Quality Assurance/Quality Control

To assess the adequacy of decontamination procedures, rinsate blanks should be collected and analyzed for the same parameters as the field samples. Specific number of blanks will be defined in the project-specific sampling plan. In general, one rinsate blank will be collected per ten samples.

6 Documentation

Field notes describing procedures used to decontaminate equipment/personnel and for collection of the rinsate blanks will be documented by on-site personnel. Field notes will be retained in the project files.

SOP 260—Aquatic Sediment Sampling

1 Purpose and Applicability

This SOP 260 describes sampling of sediments from stream and lake bottoms. Lake and stream sediment sampling is performed to define the chemical, physical, and/or biological composition of the sediments. Sediment samples may be obtained directly from shallow, slow moving waters using trowels or shovels or from deep water bodies using dredge/clam shell type samplers. Specific project requirements as described in an approved Work Plan, Sampling Plan, Quality Assurance Project Plan, or Health and Safety Plan will take precedence over procedures described in this document.

2 Responsibilities

The project manager is responsible for ensuring that a properly designed sampling program is prepared prior to any sample collection. The field sampling coordinator will have the responsibility to oversee and ensure that all sediment sampling is performed in accordance with the project-specific sampling program and SOP 260. In addition, the field sampling coordinator must ensure that all field workers are fully apprised of SOP 260.

3 Supporting Materials

The following materials must be on hand in sufficient quantity to ensure that proper sampling procedures may be followed.

- Project-specific sampling program;
- Personal protection equipment as specified in the Project Health and Safety Plan;
- Paper towels or chemical-free cloths;
- Coolers and ice;
- Dredges (e.g. Ponar) and rope;
- Shovels and/or trowels;
- Sample bottles, containers, and labels;
- Sampling implements (e.g. spoons, scoops, etc);
- Decontamination equipment and solutions;
- Field data sheets and field book;
- Waders or boat;
- Measuring tape; and

- Boating safety gear (e.g., life jackets).

4 Methods and Procedures

Select sample locations and method(s) in accordance with the project-specific sampling plan. Determine and record the depth of water at each sample location. Collect samples using appropriate sampling equipment and proper health and safety gear.

Refer to SOP 210 for guidance when using a trowel or shovel. Retrieve the sample slowly and carefully through the water column to minimize sample loss. If using a dredge, first secure the rope to the dredge. Open the dredge and lock it into position. Slowly lower the dredge through the water column to the bottom sediments. Close the jaws of the dredge by jerking the dredge rope once or twice. Pull the dredge back up through the water column at a steady, even pace. Repeat if sediment recovery is inadequate. Several attempts may be necessary to obtain sufficient sample volume. If, after several attempts, sample volume is still inadequate, adjust the sampling location. All equipment will be decontaminated after each use following the procedures outlined in SOP 120.

Specific procedures pertaining to the handling and shipment of samples shall be in accordance with SOP 110. A clean pair of gloves and decontaminated sampling tools will be used when handling the samples during collection to prevent cross contamination. A representative sample will be placed in the sampling container using a clean implement such as a scoop, spoon or tongue depressor. Sample containers shall be labeled with the following information:

- Client or project name, or unique identifier, if confidential;
- Unique sample description (i.e., sampling point number and horizontal/vertical location);
- Sample collection date and time;
- Sample collector's name or initials; and
- Analyses to be performed.

These data shall be recorded on the sediment sampling form (Figure 1) and/or field book.

If sampling from a boat, all appropriate boating safety regulations must be understood and followed by the sampling crew.

5 Quality Assurance/Quality Control

QA/QC requirements include, but are not limited to, blind field duplicates, blind rinsate blanks, and blind field blanks. These samples will be collected

on a frequency of one QA/QC sample per ten field samples or a minimum of one QA/QC sample per day unless otherwise specified in the project-specific sampling plan.

6 Documentation

Documentation may consist of all or part of the following:

- Sediment sampling forms;
- Field log book;
- Chain-of-custody forms; and
- Shipping receipts.

Field records should contain sufficient detail which provide a clear understanding of and where samples were taken. A description of sediments using the Unified Soil Classification system should be included. All documentation shall be placed in the project files and retained following completion of the project.

SOP 410—Quality Assurance/Quality Control Data Validation

1 Purpose and Applicability

RETEC SOP 410 describes the method to be used for evaluating analytical laboratory data collected during field investigations. This evaluation is performed in order to establish the validity of the data generated. The laboratory analytical data will be evaluated for precision, accuracy, and completeness. Specific project requirements as described in an approved Work Plan, Sampling Plan, Quality Assurance Project Plan, or Health & Safety Plan will take precedence over the procedures described in this document.

2 Responsibilities

The project manager will be responsible for ensuring that procedures set forth in the sampling program documents are followed in the field, and in the analytical laboratory. Where procedures differ, the most stringent project-specific document(s) will apply.

The Project Quality Assurance/Quality Control (QA/QC) Officer will be responsible for validating the analytical data for precision, accuracy, and completeness. The QA/QC Officer will work in conjunction with the project manager and Laboratory Coordinator to produce the final report

3 Supporting Materials

Section 3 is not applicable.

4 Methods and Procedures

This section presents the method and procedure for implementation of the RETEC Quality Assurance/Quality Control process for data evaluation. Analytical data will be reviewed for precision, accuracy, and completeness. The following sections provide a detailed discussion of the steps necessary to meet these criteria. The following criteria are recommended and should be evaluated on a project-specific basis.

A preliminary evaluation of the analytical data will include:

- A review of the Work Plan or Quality Assurance Project Plan (QAPP);
- A review of the laboratory project narrative;
- A review of holding times, detection limits, methods of analysis; and

- A check of data flags, reporting units, and sample matrices.

Any deviations from the requirements of the QAPP will be identified in the data evaluation report and the Project Manager will be notified. Additionally, the laboratory will be contacted, if necessary, and appropriate corrective actions will be implemented.

4.1 Evaluation of Precision

Precision is the measure of variability of individual sample measurements. Precision is determined through the analysis of replicate samples, field blanks, trip blanks, and equipment rinseate blanks. A replicate sample represents two or more separate samples collected at the same location. A replicate sample is are often referred to as a duplicate. Additionally, replicates are often submitted to the laboratory as blind samples. Field blanks consist of deionized water poured into sample bottles in the field. These blanks are used to determine whether airborne contamination is present at the site. Trip blanks are laboratory generated analyte-free water samples for volatiles analysis which travel to and from the site with the sample coolers. These blanks are used to document contamination attributed to bottle preparation and/or shipping and handling procedures. Equipment rinseate blanks consist of reagent water exposed directly to sampling equipment. The equipment rinseate blank is useful in documenting adequate decontamination of sampling equipment.

4.1.1 Duplicates

Duplicates, when collected, will be evaluated at the frequency of ten percent (10%) of samples collected for each matrix. Evaluation of replicates for precision will be done using the Relative Percent Difference (RPD). The RPD is defined as the difference between two duplicate samples divided by the mean and expressed as a percent. The RETEC advisory limit for RPDs is 50% for soil samples and 30% for groundwater. When the RPD exceeds the advisory limit, consideration will be given to the possibility of matrix effect. If however professional judgement indicates a potential laboratory error, the positive results will be "J" flagged.

4.1.2 Field Banks

Collection of a field blank is recommended for one in every 20 samples, or one sample per batch if less than 20 samples are collected. However, on a project-specific basis, analysis of field blanks may not be appropriate.

4.1.3 Trip Blanks and Rinseate Blanks

Preparation of a trip blank is recommended at one blank for each cooler if volatile analysis has been requested. Equipment rinseate blanks should be collected during each day of sampling or at a 10% frequency.

4.2 Evaluation of Accuracy

The accuracy of data is a measure of the system bias. The level of accuracy is determined through examination of a Blank Spike (BS), laboratory Matrix Spike/Spike duplicate analyses (MS/MSD), surrogate recoveries for organic analyses, and method blanks. A blank spike is a laboratory QC sample which is introduced with the sample batch to monitor the performance of the system. The BS is used to document laboratory performance and is also referred to as a Lab Control Sample (LCS), Ongoing Precision Recovery (OPR), or Lab Spike (LS). The MS/MSD is an environmental field sample which is spiked with method or client specific analytes. The MS/MSD indicates how well the lab can reproduce the analytical results on field samples. The MS/MSD can indicate matrix effects. Surrogates are compounds that are structurally similar to the compounds requested for analysis, but are not found in nature (i.e., deuterated compounds). hey are analyzed to demonstrate the percent recovery of the method by the laboratory and are applicable only for organic analysis. Method blanks or reagent blanks are analyte-free blank samples that monitor contamination introduced by the laboratory during sample preparation or analysis.

Blank spikes are recommended for one in every twenty sample analyses. A MS/MSD set is recommended for one in every twenty samples. Surrogates are compounds spiked into every sample submitted to the laboratory for organic analysis and have method specific recovery limits. A method blank will be prepared for one in every 20 samples per matrix. Method blanks are used to check on process contamination, carry over, and purity of reagents used by the laboratory.

When a BS is outside of the control limits, the laboratory should first re-analyze the sample. If it is still outside of the control limits, the laboratory should then reextract all samples in the set. If neither of the above have been done by the laboratory, then all of the data should be qualified with either a "J", indicating that the values are estimates, or an "R" which indicates that the results are unusable. The severity of flagging will be based on the professional judgement of the data reviewer and the ultimate use of the data.

MS/MSD percent recoveries and RPDs are compared to published QC limits. If the MS/MSD recoveries and/or RPDs are outside QC limits, but the BS recovery is acceptable, the samples likely have matrix interference problems. If the precision is acceptable between the MS and the MSD, then the reliability of the data is good. If the recovery in the MS or MSD is less than 10%, the corresponding unspiked sample should be qualified with a "J" for positive hits, and an "R" for non-detected results. Note that this action is taken on the sample alone, not the entire batch of samples.

When surrogate recoveries are outside QC limits, procedures described below will be followed:

- If one Base/Neutral (B/N) and/or one Acid surrogate is outside of the QC limits, and the surrogate recoveries are all greater than

10%, the positive results should then be estimated as "J", while the non-detected results should be estimated as "UJ".

- If two Base/Neutral (B/N) or two Acid surrogates (or more) are outside of the QC limits, or surrogate recovery is less than 10%, the sample should then be re-analyzed.

- If a volatile surrogate is out of QC limits, the sample should be re-analyzed.

- After the laboratory has re-analyzed the surrogates are they still outside of the QC limits, both results should be reported and the outlying recoveries attributed to matrix interference.

- If the laboratory does not re-analyze or re-extract and re-analyze, then the positive results should be flagged with a "J" and the non-detected results flagged with an "R".

- If the surrogates are outside of the QC limits for any blank, then validity of the data should be considered questionable.

4.3 Evaluation of Completeness

Completeness is a measure of the amount of data actually collected, analyzed, and validated compared to the amount specified in the sampling plan. The overall measure of completeness is the ratio of samples planned to valid analyses received. The data quality objective for the data is to achieve 90-100% accuracy and completeness of data collected, unless otherwise stated in the QAPP.

5 Quality Assurance/Quality Control

RETEC will review all data validation procedures on a yearly basis and update OA/QC procedures annually if necessary.

6 Documentation

During the data review/validation process, problems with analytical procedures, analytical results outside QC limits, or other unusual conditions will be documented. In many cases this information will be contained in the laboratory project narrative accompanying the analytical data. Where additional explanations from the laboratory are required, the information will be documented by the laboratory and provided to RETEC. The QA/QC Officer will summarize the information for inclusion into the QA/QC summary. Documentation of data review/ validation will vary depending upon the level of review required by the individual project.

7 References

Analyses, EPA (1990)

CLP Organic Data Review, EPA (1992)

EPA Contract Laboratory Program (CLP) Guidelines:
Statement of Work : Organdies 2/88
Statement of Work : Organdies 3/90
Statement of Work : Inorganic 9/91
Statement of Work : Dioxin 8/87

Laboratory Data Validation Functional Guidelines for Evaluating Organic Analyzes, EPA Region I (1988)

Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyzes, EPA Region I (1989)

Modified Laboratory Data Validation Functional Guidelines for Evaluating Organic Analyzes, EPA Region III (1992)

Modified Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyzes, EPA Region III (1993)

RARA Laboratory Audit Inspection Guidance Document, EPA (1988)

Superfund Analytical Methods for Low Level Water Organic

Three Levels of Data Review, EPA (1989)

Test Methods for Evaluating Solid Waste, SW-846, Third Edition (1993)

Attachment B

Field Forms

DAILY FIELD REPORT

RETEC

: Date:	Arrival Time:
Location/Client:	Departure Time:
Job Number:	Weather:
Purpose of Observations:	
RETEC Representative:	RETEC Project Manager:
Contractor:	Permit No.:
Contractor Rep:	Job Phone:

ATTENDEES:

SCOPE:

:TIVITIES:

ACTION ITEMS:

Surface Sediment Field Log

Job:
Job No:
Field Reps:
Contractor:

Core Location:
Date:
Sample Method:
Proposed Coordinates:

Water Height

DTS Boat: DTS Lead Line:

Tide Measurements
Time/Height: _____
Time/Height: _____

Sample Acceptability Criteria:
1) Overlying water is present
2) Water has low turbidity
3) Sampler is not overfilled
4) Surface is flat
5) Desired penetration depth

Mudline Elevation (datum): _____

Notes: _____

Grab #	Time	Confirmed Coordinates (datum)		Sample Accept (Y/N)	Recovery Depth	Comments: winnowing, jaws close, biota, overfill, good seal, and sample depth
		Northing	Easting			

Sample Description: surface cover, (density), moisture, color, minor modifier, MAJOR modifier, other constituents, odor, sheen, layering, anoxic layer, debris, plant matter, shells, biota)

Composite sample: _____

Sample Containers: _____
Analyses: